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An approach concerning the influence of inference components in motor learning process within incremental adaptation to physical effort

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Abstract

The development of motor learning process (meaning like a serial-type system) could be compared with an additive-cumulative proceeding. Each of its sequence is a part of a mini-project, being in an inference relationship one with other, defined by us, mutual potentiation. The form of the movement, that comes to be learned and performed at maximal morphokinetic parameters (form, accuracy, technicality) leads to the execution of other parameters, but in topokinetic terms (velocity, power, amplitude) and vice versa. As we refer to high performance, we cannot dissociate the two characteristics of the motor learning process, especially in high performance sport.

Keywords: mutual potentiation, inference, incremental adaptation, overcompensation;

1. Introduction

In the input of the primary stage of motor learning process, each learning unit is a part of the acting microsystem. Therefore an initial model is configured as a pattern to be achieved as algorithmic organization of the motor learning process (i.e. an inferential method). In most cases of learning a new motor skill, the athletes do not have in their own motor portfolio the appropriate structure that is to be tested. Hence we could develop later on, a series of other assessment tests which could be applied, in a correlative manner to the skill that is to be learnt.

During the motor learning process, each sequence (learning unit) will be completed through a demo of stage-level of the motor structure learnt at the time, accompanied by a sequential test (intermediate), in order to check the characteristics of fairness (the incremental-driven) or correction of errors (type decremented) as learning outcomes in that sequence, reported to the original pattern (Lee & Simon, 2004). The development of learning process conducts to an emphasized restructuring of the original chronology and operational sequences.

2. Problem statement

2.1. Purpose of the study

Along with this process, another mini-project follows-up, with ameliorative effect on the topokinetic component (refers to the development of motor aptitudes involved), leading to an enhancement effect on the level of motor

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skills, a compulsory incremental condition, in order to achieve the final motor pattern, both in terms of morphokinetic aspects (learning system: *acquirement – maintenance - improvement* of individual technique) and topokinetic outlook (higher dynamic and forceful parameters of individual execution).

In fact, this could be the main features of motor learning in high performance sport (Bejan, Jones & Jordan, 2010). Motor learning process cannot replace the development of motor aptitudes, which must be accompanied by motor skills acquisition. Thus, we stress the idea of the phenomenon to be deliberately induced by a mutual potentiation (Fig.1 and Fig.2) among two interventions upon the motor aptitudes and skills, such as inferential learning method (Neagu, 2010).

<table>
<tr><th colspan="3">▼ MUTUAL POTENTIATION ▼</th></tr>
<tr><td>Sequence I</td><td>Sequence II
◄ Inferential relationship ►
Among Sequence I and Sequence III</td><td>Sequence III</td></tr>
<tr><td colspan="3">▼ It could be: ▼</td></tr>
<tr><td colspan="2">Learning unit No. 1</td><td>Learning unit No. 3</td></tr>
<tr><td colspan="3">▼ Under the influence of: ▼</td></tr>
<tr><td colspan="3">Motor learning strategies and methods
Influence of learning algorithms
Correction of execution errors
Dynamic and continuous assessment
Refactoring of motor learning process
(changing algorithms chronology or/and its content)</td></tr>
</table>

Fig.1. Several aspects of *Mutual potentiation* in motor learning process

<table>
<tr><th colspan="3">▼ MUTUAL POTENTIATION ▼</th></tr>
<tr><td>Area I</td><td>Area II
◄ Inferential process ►
Among Area I and Area III</td><td>Area III</td></tr>
<tr><td colspan="3">▼ It could be: ▼</td></tr>
<tr><td colspan="2">Individual topogramme
(dynamic aspects of motor aptitudes)</td><td>Individual morphogramme
(technical aspects of individual motor skills)</td></tr>
<tr><td colspan="3">▼ Under the influence of: ▼</td></tr>
<tr><td colspan="2">The level of individual motor aptitudes
(velocity, strength, endurance etc.)</td><td>The level of individual motor skills
(form, accuracy, technicality)</td></tr>
<tr><td colspan="3">▼ In the context of: ▼</td></tr>
<tr><td colspan="2">General and specific physical preparation
(developing of motor aptitudes involved)</td><td>Technical preparation
(forming, setting and improving of individual technicality portfolio)</td></tr>
</table>

Fig.2. Several aspects of *Mutual potentiation* in sport training process

2.2. Technical solution

The aim of applying all these methods is to reduce the risk of building the procedural sequences named motor decrements (labile or unstable motor skills, wrong or partially correct), from both morpho and topokinetical views (Abernethy, 1991). This could be a new paradigm of analysis in the context of our applied research (Fig. 3). Otherwise, the inference sought by us, could be transformed into a repetitive and linear process on its longitudinal conduct (Larman & Basili, 2003), described sometimes by the presence of interference phenomena (with disruptive effects) between the operationalized sequences of the motor learning units, and beyond (Brady, 1998). Instead of inference learning process, it will be developed an interfering modular process in stagnation, with many unnecessary resources impact (Charles & Bejan, 2009). This loss will induce effects which will disturb the psychomotor behavior with psycho-pedagogical failures and dalliance alike (Neagu, 2010).

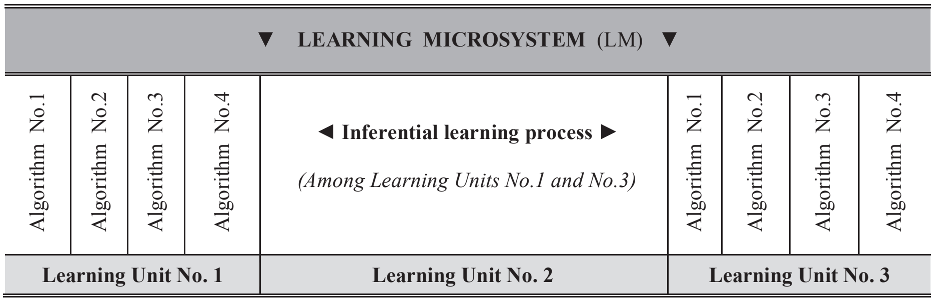

Fig. 3. A notional pattern of structural organization of the algorithms before refactoring intervention in motor learning process

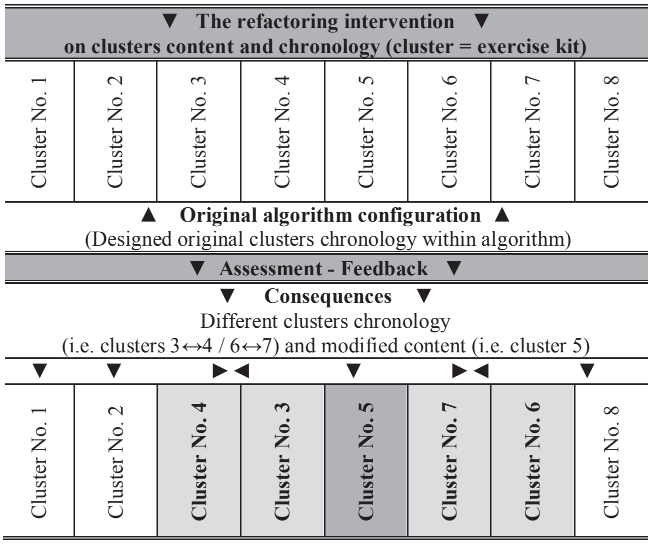

Fig. 4. The translation of cluster positions and changing position after refactoring and evaluation intervention

Dismantling or gradual decomposition algorithms already accomplished is generated by evolution of the motor learning process, due to the increase of its complexity. Once added a new learning sequence, with new tasks and functions, it is actually built on the existing *pattern*, sometimes unprepared to bear it (Doyon & Benali, 2005). At that time, the whole model will be systemically reconfigured, so that it could take in an inferential systemic path.

We could define the restructuring operation of the initially operational model as *refactoring* of the motor learning process, with strong inferential effects of its sequences. Restructuring, namely *refactoring* (Fields, Harvie, Fowler & Beck, 2009) will lead eventually even to redesigning the entire learning process, whether the post-sequence results would not be the predicted ones. R*efactoring* process has to be done gradually and flexible. Restructuring one of the algorithms could be a first step. Then it will be possible even a structural algorithmic unit translation to another position, in the chronology of executions, within the same learning sequence, defined by us as *intramodal translation*, or moving it to another learning sequence (motor learning unit) defined by us as *intermodal translation.* Refactoring could mean coupling or uncoupling, bringing together or sub-sequential decomposing some components of learning sequences. As it can be seen, there are various possibilities of reconfiguring, as well as structural reorganization, (Beck, 2004).

2.3.The relationship between motor learning and the adaptation of organism to physical effort

One of the consequences of motor learning (form, content, spatial-temporal and dynamic parameters) is the final motor product (as structural and functional part of the involved movement continuity – kinematic chain) as a result of motor learning, referred as terms: physical exercise, motor structure, motor action or motor act, technical element, motor skill etc. All these terms are directly related to a specific sport field in the context of training process.

One of the characteristics of this process is its cyclicality. It is fundamental to have a rank of high principle. The alternation of different efforts (with high intensity and a very complex strain) with the repose and post-effort recovery causes an adaptation phenomenon of athlete organism, defined as *overcompensation*. As a concept, *overcompensation* has been introduced during the decade of 1949-1959 by the so-called founder of effort biochemistry in sport field, Nikolai N. Yakovlev (1911-1992).

Overcompensation defines, in fact, that state of psycho-physical optimum of the athlete body, following a systematic training process, advisably designed by the coach. All these processes will allow the athlete to be able to support increasingly to intensive efforts in terms of *morfo* and *topokinetic* parameters and much more as against to earlier personal performances. We define this qualitative concomitant step as *incremental adaptation* to the physical effort (Neagu, 2010). Sometimes this phenomenon of performance progress appears to be an unexpected one, surprising even the most experienced coaches.

As an extrapolation of mutual potentiation relationship, we assist to an incremental adaptation process with the same relationship between different stages of overcompensation throughout an annual cycle of training process (Fig. 5). So we can conclude that mutual potentiation relationship could also be applied in high performance domain.

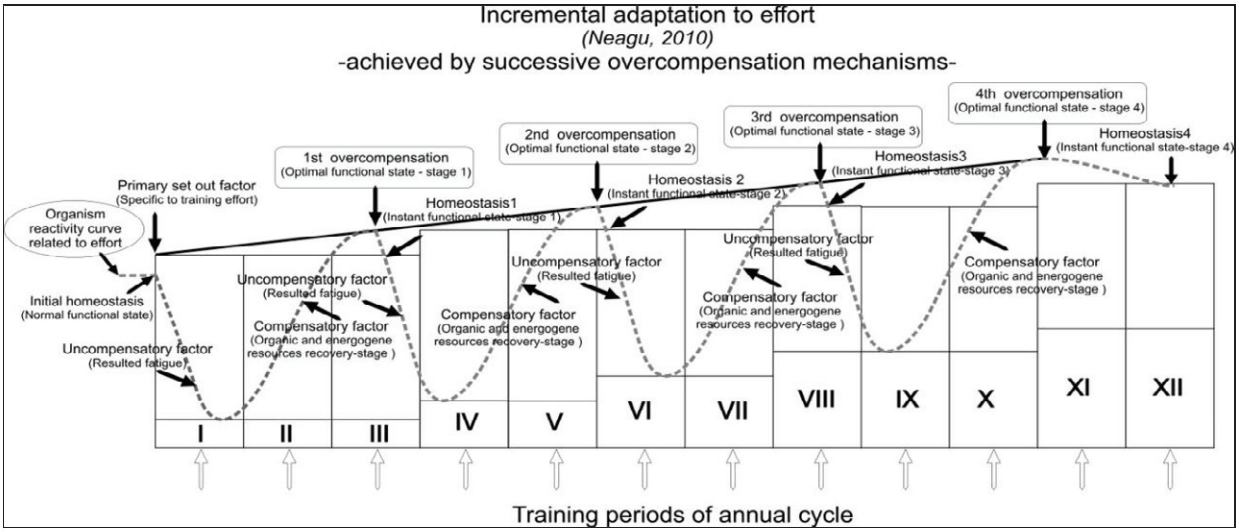

Fig.5. Incremental aspects of adaptive overcompensation in sport training process

3. Conclusion

Extrapolating this process to the computer programming field, within the intimate human association cortex - requested by specific information storage and association learning, we believe that the efficiency of the execution of a motor structure is inversely proportional to the number and complexity of the entire assembly process and of the interventional refactoring.

We believe that such an approach of motor learning process can lead through a deeper and refined analysis, to render the efficiency of algorithmic exercise structures, especially for those difficult and complex structures, starting from the concepts appropriate to IT and cybernetics framework.

As a final conclusion, the *reconfigured post-writing* of a new learning sequence, achieved after the corrective assessment of a sequence already done, becomes another distinctive element for this type of learning. The process will be a phasic one, synchronic and diachronic alike: from simple to complex, from unstable to stable, from incorrect or partially correct, to correct, from right to refined and ultimately, to a high performance one.

Thus, between motor learning - linked to the aptitudes development, skills and driving habits and smart learning - related to notions and concepts, there is a relationship of functional complementarity. Altogether, they provide a comprehensive learning in different sport disciplines, as well as practical learning and developing various situations, mainly in high performance training.

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